

# Congruent Triangles

## Objectives:

Learn and apply the properties of congruent triangles.

**4-1**

**Practice**

**Classifying Triangles**

For Exercises 1–7, refer to the figure at the right. Triangle  $ABC$  is isosceles with  $AB > AC$  and  $AB > BC$ . Also,  $\overleftrightarrow{XY} \parallel \overleftrightarrow{AB}$ . Name each of the following.

- sides of the triangle
- angles of the triangle
- vertex angle
- base angles
- side opposite  $\angle BCA$
- congruent sides
- angle opposite  $\overline{AC}$

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Use a protractor and ruler to draw triangles using the given conditions. Classify each triangle by the measures of its angles and sides.

8.  $\triangle BHE$ ,  $BE = 1$  inch,  $m\angle E = 60^\circ$ ,  
 $HE = \frac{1}{2}$  inch

scalene  
acute

9.  $\triangle QTR$ ,  $m\angle T = 60^\circ$ ,  $QT = TR = 4$  cm

equilateral  
acute

10. Find the measures of the legs of isosceles triangle  $ABC$  if  $AB = 2x + 4$ ,  $BC = 3x - 1$ ,  $AC = x + 1$ , and the perimeter of  $\triangle ABC$  is 34 units.

$AB = 2x + 4$  (14)  
 $AC = x + 1$  (6)  
 $BC = 3x - 1$  (6)

$x + 1 = 6$   
 $6x + 4 = 34$   
 $-4 \quad -4$   
 $6x = 30$   
 $x = 5$

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Geometry

4-2

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## Practice

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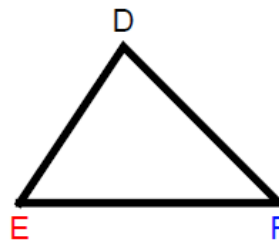
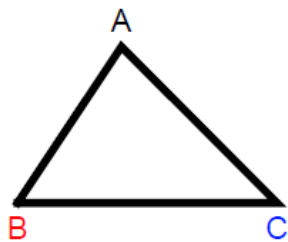
### Measuring Angles in Triangles

Find the value of  $x$ .

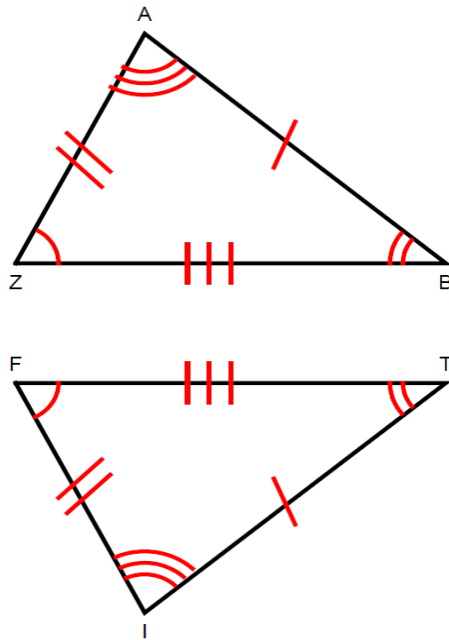
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When two figures have the same shape and size, they are called **congruent**. We have already discussed congruent segments (segments with equal lengths) and congruent angles (angles with equal measures). Two triangles are **congruent** if and only if their vertices can be matched up so that *corresponding parts* (angles and sides) of the triangle are congruent.



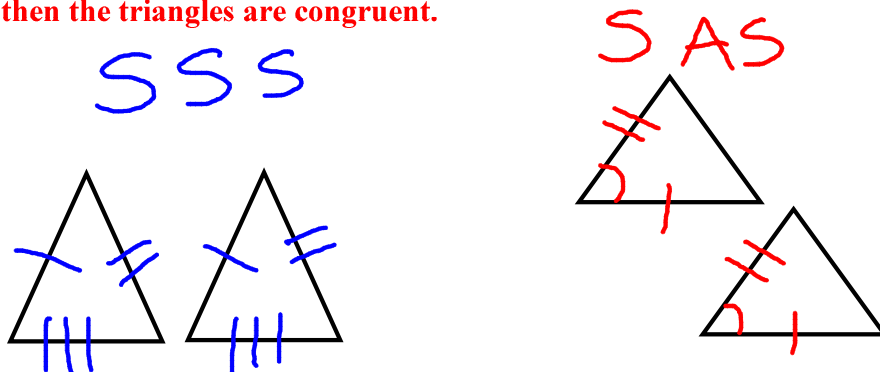
The congruent parts of the triangles shown below are marked alike.



### Types of Congruence

**Postulate 12 Side-Side-Side (SSS) Postulate** If three sides of one triangle are congruent to three sides of another triangle, then the triangles are congruent.

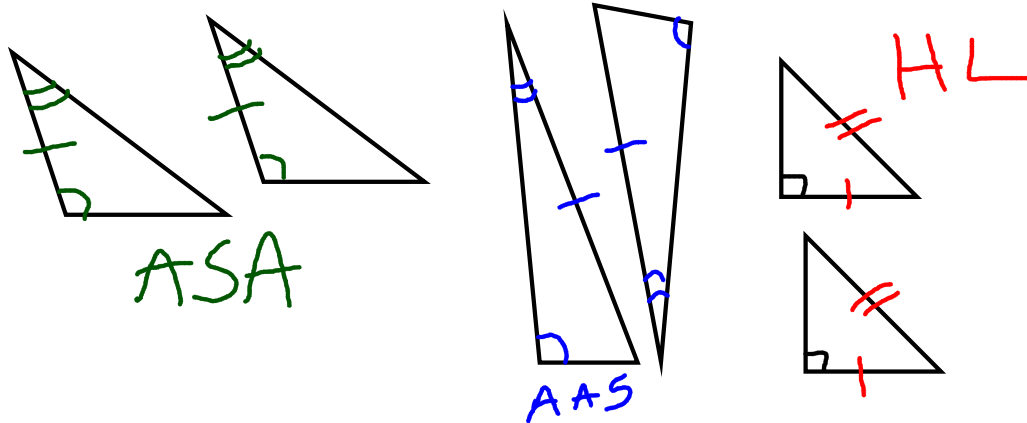
**Postulate 13 Side-Angle-Side (SAS) Postulate** If two sides and the included angle of one triangle are congruent to two sides and the included angle of another triangle, then the triangles are congruent.



**Postulate 14 Angle-Side-Angle Postulate** If two angles and the included side of one triangle are congruent to two angles and the included side of another triangle, then the triangles are congruent.

**Angle-Angle-Side (AAS) Theorem** If two angles and a non-included side of one triangle are congruent to the corresponding parts of another triangle, then the triangles are congruent.

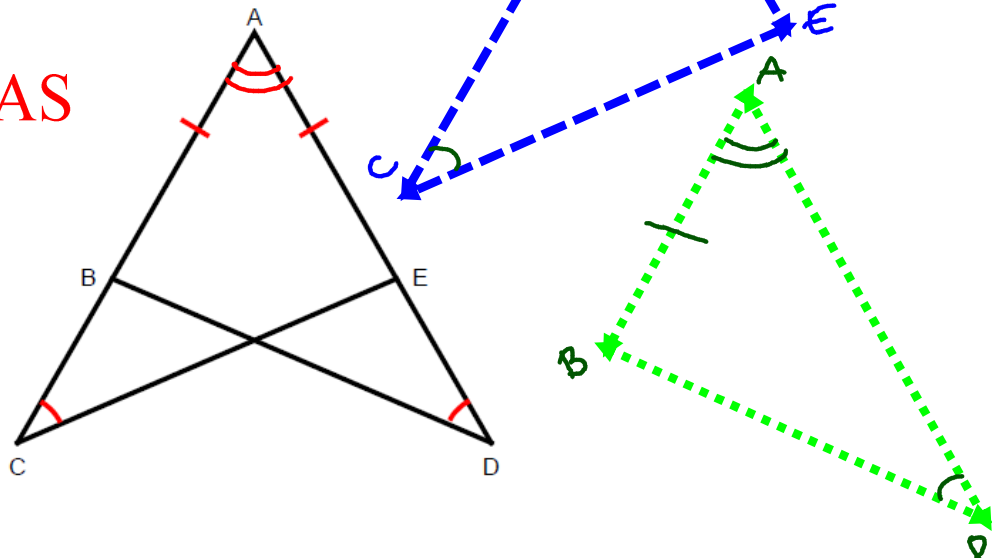
**HL Theorem** If the hypotenuse and a leg of one right triangle are congruent to the corresponding parts of another right triangle, then the triangles are congruent.

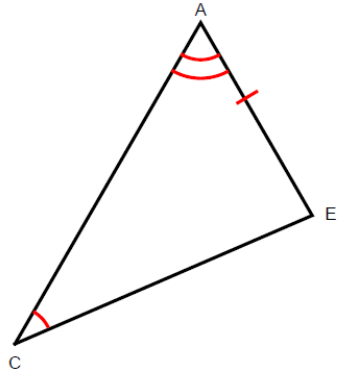


**Given:**  $\overline{AE} \cong \overline{AB}$ ,  $\angle C \cong \angle D$

**Prove:**  $\triangle ACE \cong \triangle ADB$

**AAS**





AAS

